MDS OPS
A Mission Operations System Architecture for Goal-based Missions

ABSTRACT

The Mission Data System (MDS) Project at NASA's Jet Propulsion Laboratory is creating a unified flight, ground and test data system architecture for space missions. The MDS seeks to provide earlier collaboration between mission, system and software designs while lowering design and test costs through a unifying architecture and a set of reusable components, leading to simplified and lower cost operations implementing automation and goal-based control that is evolvable from simple to sophisticated autonomous applications depending on mission requirements.

The concept of state as a representation of the condition of a system is central to the architecture of the MDS. The representation of a system's state as well as the methods for determining and controlling state are achieved through the explicit use of models in the MDS. The MDS permits goal-directed operations of a space mission by allowing operators to specify intent in the form of constraints on the value of a state over a specified time interval.

The MDS will be used as the unified flight and ground data system architecture for NASA's Europa Orbiter Mission scheduled to be launched in 2004 and will become JPL's advanced multimission architecture for other future missions such as Pluto/Kuiper Express and Solar Probe.

This paper will present a mission operations system architecture for flying missions using the state-based, goal-oriented architecture of the MDS. It will address the key challenges in system development and operation throughout a project's lifecycle, including model development and validation, planning and control, state analysis and determination, simulation, and data management. It will also address the issues of system flexibility, evolvability, robustness, and cost effectiveness from a mission operations perspective.